IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:

Richard I. Masel et al.

Senial No.:

10/578,055

hf. No.:

4911

For:

July 27, 2006

FORMIC ACID FUEL CELLS AND

CATALYSTS

Art Unit:

1745

Examiner:

Unknown

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July 31, 2007

Date

Attorney for Applicant(s) Registration No. 40,607

INFORMATION DISCLOSURE STATEMENT

Mail Stop Amendment Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450

Dear Sir:

This IDS is submitted under 37 C.F.R. §1.97(b) within any of the following time periods, whichever occurs last:

- within three months of either the filing date of the application or the date of entry into the (a) national stage; or
- before the mailing date of First Office Action on the merits (i.e., not including actions such as restriction requirements); or
- before the mailing of a First Office Action after the filing of a Request for Continuing (c) Examination.

Applicant(s) submit herewith Form PTO-1449 (Information Disclosure Citation) together with copies of foreign patents, publications or other information of which applicant(s) are aware, which applicant(s) believe may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 C.F.R. §1.56. Applicant(s) respectfully submit that the citation of any reference on Form PTO-1449 does not constitute an admission that the reference qualifies as prior art.

It is requested that the information disclosed on the enclosed Form PTO-1449 be made of record in this application.

Copies of the all cited references can be found in application Serial No. 10/817,361, filed April 2, 2004; application Serial No. 10/407,385 now U.S. Patent No. 7,132,188; and in application Serial No. 10/664,772; which the present applications claim priority on (see, 37 C.F.R. §1.98(d)) except for the following references: GB1292791 and GB1273045 and 6,485,851 which are provided herewith.

The Commissioner is hereby authorized to charge any additional fees which may be required to this application under 37 C.F.R.§§1.16-1.17, or to credit any overpayment, to Deposit Account No. 07-2069. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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U.S. PATI	ENT DOCUMENTS	R	FRADENIA								
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	3,198,666		G. Gruneberg et al.		Subclass		ropriate				
	3,297,487		Pomeroy et al.			-					
	3,506,494		Adlhart		†						
	3,711,385	01/16/1973	Beer								
	4,039,409		LaConti et al.	Conti et al.							
-	4,081,409	03/28/1978	McNicol et al.		†						
	4,127,468	11/28/1978	Alfenaar et al.			1					
	4,431,750	02/14/1984	McGinnis et al.		 						
1		05/08/1984	Luczak et al.	iā.							
	4,457,823	07/03/1984	LaConti et al.								
	4,457,986	07/03/1984	Bindra et al.								
	4,478,917	10/23/1984	Fujita et al.								
	4,797,380	01/10/1989	Motoo et al.								
	4,806,515	02/21/1989	Luczak et al.								
	4,822,699	04/18/1989	Wan et al.		†		<u> </u>				
-	4,493,878	01/15/1985	Horiba et al.		 						
	5,004,424	04/02/1991	Larminie								
	5,024,905	06/18/1991	Itoh et al.								
	5,096,866	03/17/1992	toh et al.								
	5,183,713	02/02/1993	Kunz								
	5,208,207	5/04/1993	Stonehart et al.								
	5,225,391	07/06/1993	Stonehart et al.								
- +	5,246,791	09/21/1993	Fisher et al.								
	5,364,711	11/15/1994	Yamada et al.	,							
	5,393,619	02/28/1995	Mayer et al.								
	5,599,637	02/04/1997	Surampudi et al.		-						
	5,599,638	02/04/1997	Surampudi et al.								
	5,773,162	06/30/1998	Surampudi et al.								
, — — X	5,856,036	01/05/1999	Smotkin et al.		11.	9					
	5,885,729	03/23/1999	Marchetti								
	5,904,740	05/18/1999	Davis et al.								
	6,007,934	12/28/1999	Auer et al.								
FOREIGN	PATENT DOCUMENTS										
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			Country	Class	Subclass						
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	JP-01227361A	March 7, 1988	Japan			Abs.	····				
			Great Britain								
	1273045	May 3, 1972	Great Britain								
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Sheet <u>2</u> of <u>6</u> Form PTO-1449 U.S. Department of Commerce Serial No.: 10/578,055 Attorney Docket No.: 1201.68586 (Rev. 8-88) Patent and Trademark Office Applicant: Richard I. Masel et al. INFORMATION DISCLOSURE CITATION (Use several sheets if necessary) Filing Date: May 2, 2006 Group: 1745 **U.S. PATENT DOCUMENTS** Filing Date Examiner Initial* **Document Number** Name Class **Subclass** If Appropriate Date 6,020,083 02/01/2000 Breault et al. 6,146,782 | 11/14/2000 Wendt et al. 6,165,635 | 12/26/2000 Auer et al. 6,248,460 | 06/19/2001 Surampudi et al. 6,284,402 09/04/2001 Mallouk et al. 6,326,098 | 12/04/2001 Itoh et al. 6,387,557 05/14/2002 Krasij et al. 6,432,284 08/13/2002 Narayanan et al. 6,447,941 | 09/10/2002 Tomimatsu et al. 6,458,479 | 10/01/2002 Ren et al. 6,492,147 | 12/10/2002 Imamura et al. 6,492,052 | 12/10/2002 Ren 6,495,278 | 10/01/2002 Schmid et al. 6,498,121 | 12/24/2002 Gorer 6,517,965 | 02/11/2003 Gorer 6,533,827 | 04/19/2003 Cisar et al. 6,649,300 11/18/2003 Ito et al. 6,660,680 | 12/09/2003 Hampden-Smith et al. 6,670,301 | 12/30/2003 Adzic et al. 6,686,308 02/03/2004 Mao et al. 6,723,678 04/20/2004 Gorer 6,770,394 08/03/2004 Appleby et al. 6,924,055 08/02/2005 Hirsch et al. FOREIGN PATENT DOCUMENTS Translation **Document Number Subclass** Date Country Yes No Class OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.) Papageorgopoulos, D. et al.; "CO Tolerance of Pd Rich Platinum Paladium Carbon Supported Electrocatalysts fro PEMFC Applications", Journal of the Electrochemical Society, in press, August 2002, pp. 1-22. Adzic, R. et al.: "Structural Effects in Electrocatalysis", J. Electroanal. Chem., 1983, pp. 79-88. Avramov-Ivic, M. et al.; "The electrocatalytic properties of the oxides of noble metals in the electrooxidaton of methanol and formic acid", Electrochimica Acta, 2001, pp. 3175-3180 Baldauf, M. et al.; "Formic Acid Oxidation on Ultrathin Pd Films on Au(hkl) and Pt(hkl) Electrodes", J. Phys. Chem., 1996, pp. 11375-11381. Becerik, I. et al.; "Electro-oxidation of Formic Acid on Highly Dispersed Platinum and Perchlorate Doped Polypyrrole Electrodes", Journal of The Electrochemical Society, 2001, pp. D49-D54. Capon, A. et al.; "The Effect of Strong Acid on the Reactions of Hydrogen And Oxygen on the Noble Metals a Study Using Cyclic Voltammetry and a New Teflon Electrode Holder", Electroanalytical Chemistry and Interfacial Electrochemistry, 1972, pp. 275-286. **Date Considered** Examiner *Examiner: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form PTO-1449 U.S. Department of Commerce (Rev. 8-88) Patent and Trademark Office				Attorney Docket No.: 1201.68	Serial No.: 10/578,055			
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U.S. PATE	NT DOCUMENTS							
Examiner Initial*	Document Number Date			Name	Class	Subclass	Filing Date If Appropriate	
	2004/0115518	06/17/2004	Masel et al.					
	2003/0170508	09/11/2003	Beckmann e	Beckmann et al.				
	6,485,851	11/26/2002	Narayanan e	et al.				
FOREIGN	PATENT DOCUMENTS		T		<u></u>	Ţ		
							Transla	ition
	Document Number	Date	Country	Class	Subclass	Yes	No	
			· · · · · · · · · · · · · · · · · · ·	ng Author, Title, Date, Pertinent				
	· ·			loble Metal Electrodes II. A Comcial Electrochemistry, 1973, pp.	•		viour of	Pure
10	Capon, A. et al.; "The Oxidation of Formic Acid on Noble Metal Electrodes III. Intermediates and Mechanism on Platinum Electrodes", <i>Electroanalytical Chemistry and Interfacial Electrochemistry</i> , 1973, pp. 205-231.							
	Capon, A. et al.; "The Oxidation of Formic Acid on Noble Metal Electrodes IV. Platinum and Palladium Electrodes", Electroanalytical Chemistry and Interfacial Electrochemistry, 1975, pp. 285-305.							
	Chi, N. et al.; "Electrocatalytic oxidation of formic acid by Pt/Co nanoparticles", Catalysis Letters Vol. 71, No. 1-2, 2001, pp. 21-26.							
	Clavilier, J. et al.; "Heterogeneous electrocatalysis on well defined platinum surfaces modified by controlled amounts of irreversibly absorbed adatoms", Part I: Formic Acid Oxidation on the Pt (III) –Bi system. <i>J. Electroanal. Chem.</i> , 1989, pp. 89-100.							
	Climent, V. et al.; "Electrocatalysis of formic acid and CO oxidation on antimony-modified Pt(111) electrodes", Electrochimica Chemistry, 1993, pp. 1403-1414.							
	El-Shafei, A. et al.; "Electrocatalytic oxidation of formic acid on Pt binary and ternary electrodes in H ₃ PO ₄ ", <i>Journal of Electroanalytical Chemistry</i> , 1993, pp. 159-165.							
	El-Shafei, A.; "Study of nickel upd at a polycrystalline Pt electrode and its influence on HCOOH oxidation in acidic and nearly neutral media", <i>Journal of electroanalytical Chemistry</i> , 1998, pp. 81-89.							
	Fernandez-Vega, A. et al.; "Heterogeneous electrocatalysis on well defined platinum surfaces modified by controlled amounts of irreversibly absorbed adatoms", Part II: Formic Acid Oxidation on the Pt (100) Sb system. <i>J. Electroanal. Chem.</i> , 1989, pp. 101-113.							
	Gonzalez, M.J. et al.; "Electrocatalytic Oxidation of Small Carbohydrate Fuels at Pt-Sn Modified Electrodes", J. Phys. Chem. 1998, pp. 9881-9890.							hys.
	Ha, S. et al.; "A miniatur	e air breathing	direct formic	acid fuel cell", Journal of Power	Sources	s, 2004, pp.	119-124	
	Ha, S. et al.; "Methanol of 2002, pp. 655-659.	conditioning for	r improved pe	rformance of formic acid fuel ce	ells", <i>Joui</i>	mal of Powe	r Source	∋s,
	Harmsen, J. et al.; "Kine Applied Catalysis, 1997,		or wet air oxida	ation of formic acid on a carbon	supporte	ed platinum	catalyst"	1
	Hartung, T. et al.; "Catal Electroanal. Chem., 198	· ·	_	nonolayers on the Electrooxidat	ion of Fo	ormic Acid o	า Pt", <i>J</i> .	
	Herrero, E. et al.; "Oxidation of formic acid on Pt(111) electrodes modified by irreversibly absorbed tellurium", <i>Journal of Electroanalytical Chemistry</i> , 1995, pp. 161-167.							
	Herrero, E. et al.; "Oxidation of formic acid on Pt(100) electrodes modified by irreversibly absorbed tellurium", Journal of Electroanalytical Chemistry, 1995, pp. 145-154.							
	Jiang, J. et al.; "Nanostructured platinum as an electrocatalyst for the electrooxidation of formic acid", <i>Journal of Electroanalytical Chemistry</i> , 2002, pp. 64-70.							
Examiner Date Considered								
*Examiner:	citation		formance and	r not citation is in conformance I not considered. Include copy of				rough

Form PTO-1449 U.S. Department of Commerce (Rev. 8-88) Patent and Trademark Office INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)				Attorney Docket No.: 1201.68586						
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	Document Number	Date	Country		Class	Subclass	Yes	No		
								-		
	Beden, B. et al.; "Electrocatalytic Activity of Noble Metals for the Oxidation of Formate in Neutral Medium", <i>J. Electroanal. Chem.</i> , 1979, pp. 127-131. Llorca, M. et al.; "Formic acid oxidation on Pd _{ad} +Pt(100) and Pd _{ad} + Pt(111) electrodes", <i>Journal of Electroanalytical Chemistry</i> , 1994, pp. 151-160. Llorca, M. et al.; "Formic acid oxidation on Pt(111) electrodes modified by irreversibly absorbed selenium", <i>Journal of electroanalytical Chemistry</i> , 1994, pp. 217-225. McGovern, M. et al.; "Effects of Nafion as a binding agent for unsupported nanoparticle catalysts", <i>Journal of Power Sources</i> , 2003, pp. 35-39. Shen, P. et al.; "Performance of CO-electrodeposited Pt-Ru/WO ₃ electrodes for the electrooxidation of formic acid at room temperature", <i>Journal of Electroanalytical Chemistry</i> , 1995, pp. 223-225. Waszczuk, P. et al.; "A nanoparticle catalyst with superior activity for electrooxidation of formic acid", <i>Electrochemistry Communications</i> , 2002, pp. 599-603 Rhee, Y. et al.; "Crossover of formic acid through Nafion® membranes", <i>Journal of Power Sources</i> , 2003, pp. 35-38.									
	Pron'kin, S. et al.; "Nanoparticle of Pt hydrosol immobilized on Au support: an approach to the study of structural effects in electrocatalysis", <i>Electrochimica Acta</i> , 2001, pp. 2343-2351.									
				ells", Journal of Power Sources		p. 229-235.				
	Rice, C. et al.; "Direct formic acid fuel cells", <i>Journal of Power Sources</i> , 2002, pp. 83-89. Gasteiger`, H. et al.; "Electro-Oxidation of Small Organic Molecules on Well-Characterized Pt-Ru Alloys", <i>Electrochimica Acta</i> , Vol. 39, No. 11/12, 1994, pp. 1825-1832. Smith, S. et al.; "Structural effects on the oxidation of HCOOH by bismuth modified Pt(111) electrodes with (110)									
	manatomic steps", <i>Journal of Electroanalytical Chemistry</i> , 1999, pp. 43-49. Shibata, M. et al.; "Electrocatalysis by Ad-Atoms", Part XXII: Shole Control By Ad-Atoms on HCOOH Oxidation. <i>J. Electroanal Chem.</i> , 1988, pp. 253-264.									
	Chen, M. et al.; "Enhance of rotation rate", Electron			al oxidation of formic acid. Effe	cts of ani	on absorption	on and v	ariation		
Examiner			Date	e Considered			4.5			
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Form PTO-1449 U.S. Department of Commerce (Rev. 8-88) Patent and Trademark Office INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)				Attorney Docket No.: 1201.68586 Serial No.: 10/578,055						
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		OTHER	DOCUMENTS	(Including Au	uthor, Title, Date, Pertinent Pag	es, Etc.)				
- 0	n.	Beltowska-Brzezinska M	/l. et al.; "The Ir	ifluence of Up	d-Lead on the Absorption of Fo a, Vol. 30, No. 11, 1985, pp. 14	ormaldeh		Acid an	d	
		Xia, X.; "New insights into the influence of upd Sn on the oxidation of formic acid on platinum in acidic solution", Electrochimica Acta, 1999, pp. 1057-1066.								
		Xiang, J. et al.; "Investigation of the mechanism of the electrochemical oxidation of formic acid at a gold electrode in sulfuric acid solution", <i>Journal of Electroanalytical Chemistry</i> , 2001, pp. 95-100.								
		Yang, Y. et al.; "Surface modification and electrocatalytic properties of Pt(100), Pt(110), Pt(320) an Pt(331) electrodes with Sb towards HCOOH oxidation", <i>Electrochimica Acta</i> , 2001, pp. 4339-4348.								
		Sobkowski, J. et al.; "The Behaviour of Formic Acid on a Rhodium Electrode", <i>J. Electroanal. Chem.,</i> 1978, pp. 309-320.								
		Zhang, X. et al.; "Electrocatalytic Oxidation of Formic Acid on Ultrafine Palladium Particles Supported on a Glassy Carbon", <i>Electrochimica Acta</i> , Vol. 40, No. 12, 1995, pp. 1889-1897.								
	Щ	M. Watanabe, "Electrocatalysis By Ad-Atoms, Part XIII. Preparation of Ad-Electrodes with Tin Ad-Atoms for Methanol Formaldehyde and Formic Acid Fuel Cells", J. Electroanal. Chem. 191, December 1985, p. 367-375.								
		M. Watanabe, "Electrocatalysis By Ad-Atoms, Part XXIII. Design of Platinum Ad-Electrodes for Formic Acid Fuel Cells with Ad-Atoms of the IVth and the Vth Groups," J. Electroanal. Chem. 250, February 1988, p. 117-125.								
		Zhu, Y. et al.; "High power density direct formic acid fuel cells", <i>Journal of Power Sources</i> , 2004, pp. 8-14.								
									- 1	
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	· · · · · · · · · · · · · · · · · · ·			thor, Title, Date, Pertinent Pag					
	A. Wieckowski and R. I. Masel, , "UHV and electrochemical studies of CO and methanol adsorbed at platinum/ruthenium surfaces, and reference to fuel cell catalysis," Electrochimica Acta 47, 22-23, 3637-3652 (2002).								
	N. Markovic, H. Gasteiger, P. Ross, X. Jiang, I. Villegas and M. Weaver, "Electro-oxidation mechanisms of methanol and formic acid on Pt-Ru alloy surfaces," Electrochimica Acta, 40, 91-98, (1995).								
	M. Arenz, V. Stamenkovic, T. J. Schmidt, K. Wandelt, P. N. Ross and N. M. Markovic, "The electro-oxidation of formic acid on Pt Pd single crystal bimetallic surfaces," Physical Chemistry Chemical Physics, 5, 4242, (2003).								
	N. Watanabe, K. Iwatsu, A. Yamakata, T. Ohtani, J. Kubota, J. N. Kondo, A. Wada, K. Domen and C. Hirose, "SFG study of formic acid on a Pt(110)-(1x2) surface," Surf. Sci., 651, 357-358, (1996).								
	S. W. Jorgensen and R. J. Madix,, "Active oxygen on Group VIII metals: activation of formic acid and formaldehyde on Pd(100)," J. Am. Chem. Soc., 110, 397, (1988).								
	F. Solymosi and I. Kovacs, "Adsorption and reaction of HCOOH on K-promoted Pd(100) surfaces," Surf. Sci., 259, 95, (1991).								
	C. Xu and D. W. Goodman, "Adsorption and Reaction of Formic Acid on a Pseudomorphic Palladium Monolayer on Mo(110)," J. Phys. Chem., 100, 245, (1996).								
	R. R. Adzic, A.V. Tripkovic and N. M. Markovic, "Structural Effects in Electrocatalysis, Oxidation of Formic Acid and Oxygen Reduction on Single-Crystal Electrodes and the effects of Foreign Metal Adatoms," Electroanal. Chem., 150 79-88, (1983).								
	Guo-Qiang Lu, Alechia Crown, and Andrzej Wieckowski, "Formic Acid Decomposition on Polycrystalline Platinum and Palladized Platinum Electrodes," J. Phys. Chem. B 1999, 103, pp. 9700-9711.								
	Weber, M.; Wang, J.T.; Wasmus, S; Savinell, R.F.; "Formic Acid Oxidation in a Polymer Electrolyte Fuel Cell: A Real-Time Mass-Spectrometry Study," J. Electochem. Soc., 1996, 143(7), L158-I160.								
	P. Waszczuk, J. Solla-Gullón, H.S. Kim, Y.Y. Tong, V. Montiel, A. Aldaz, and A. Wieckowski, "Methanol Electrooxidation on Platinum/Ruthenium Nanoparticle Catalysts," Journal of Catalysis 203, pp. 1-6 (2001).								
	Gdowski, G.E.; Fai, J.A.; Maxid, R.J.; Reactive Scattering of Small Molecules from Platinum Crystal Surfaces: D ₂ CO, CH ₃ , CH ₃ OH, HCOOH and the Nonanomalous Kinetics of Hydrogen Atom Recombination, Surf. Sci., 1983, 127(3) 541-54.								
Examiner			Date	Considered					
*Examiner:	citatio		formance and	not citation is in conformance not considered. Include copy				rough	